CLAIMS

What is claimed is:

1   A method for media delivery in a network, comprising the steps of:

2   (a)   determining an available bandwidth for file transmission for a time interval;

3   and

4   (b)   allocating at least a portion of the available bandwidth to at least one file

5   transmission task, wherein each of the at least one file transmissions task may be allocated a

6   different amount of the available bandwidth.

1   2.   The method of claim 1, which includes the step of initializing a bandwidth

2   allocation scheduler prior to the determining step (a), comprising the steps of:

3   (a1)   obtaining a plurality of system configuration parameters from a plurality of

4   database tables;

5   (a2)   initializing a global step function (GSF); and

6   (a3)   subtracting from the GSF bandwidth requirements for a plurality of on-going

7   life-video stream (LVS) jobs and LVS jobs planned from a time of initialization to a maximum

8   transmission duration.

1   3.   The method of claim 2, wherein the subtracting step (a3) comprises the steps

2   of:

3   (a3i)   recording in the plurality of database tables the LVS jobs and their bandwidth

4   requirements;

(a3ii)   subtracting from the GSF the bandwidth requirements for the LVS jobs; and

(a3iii)   logging a total remaining available bandwidth that can be scheduled for file

transmissions in the plurality of database tables.

4.   The method of claim 1, wherein the determining step (a) comprises the steps of:

(a1)   updating a total available bandwidth for the time interval; and

(a2)   checking for the available bandwidth for file transmission for the time interval.

5.   The method of claim 4, wherein the updating step (a1) comprises the steps of:

(a1i)   reading from a plurality of database tables a plurality of LVS jobs to begin

during the time interval;

(a1ii)   allocating bandwidth to the plurality of LVS jobs not yet allocated bandwidth;

and

(a1iii) recording the allocated bandwidth to the plurality of LVS jobs in the plurality

of database tables.

6.   The method of claim 5, wherein prior to the reading step (a1i) comprises the

steps of:

(a1iA)   determining if the updating of the total available bandwidth occurs often

enough to avoid conflicts with plurality of LVS jobs; and

(a1iB)   reporting an error if the updating does not occur often enough.

7.   The method of claim 5, wherein the allocating step (a1ii) comprises the step of:

(a1iiA) subtracting from a GSF the bandwidth requirements for the plurality of LVS jobs.

8.   The method of claim 5, wherein the checking step (a2) comprises the steps of:

(a2i)   updating a GSF;

(a2ii)   determining if enough bandwidth is available for file transmissions;

(a2iii) sending an indication if there is not enough bandwidth available for file transmission; and

(a2iv) finding a bandwidth strip which begins at a current time, fits under the GSF, has at least a minimum amount of bandwidth that must be allocated to a file transmission task, and does not extend, in the X/time-direction, beyond a latest delivery time (LDT) of the at least one transmission task..

9.   The method of claim 8, wherein the finding step (a2iv) comprises the step of:

(a2ivA)   finding the bandwidth strip that extends in an X/time-direction from a current time to no more than a maximum transmission duration, and in a Y/bandwidth-direction from zero to no more than a value of the GSF at any X/time value spanned by the bandwidth strip;

(a2ivB)determining if an area of the bandwidth strip is no smaller than a predetermined area;

(a2ivC)indicating not enough bandwidth for file transmission if the area of the largest found bandwidth strip is smaller than the predetermined area, or is not within a plurality of pre-determined boundary conditions; and

11   (a2ivD)returning a size limitation for the at least one file transmission task if the area of

12   the bandwidth strip is smaller than the predetermined area.

1   10.   The method of claim 1, wherein the allocating step (b) comprises the steps of:

2   (b1)   setting an upper bound on an amount of bandwidth to a smaller of the available

3   bandwidth and a maximum bit rate of a plurality of receivers;

4   (b2)   gathering data for the at least one file transmission task, the gathered data

5   including a size of the at least one file transmission task;

6   (b3)   determining an allocation strategy selected by the customer;

7   (b4)   computing an overhead for the at least one file transmission task;

8   (b5)   allocating the portion of the available bandwidth based on the upper bound, the

9   size of the at least one transmission task, the computed overhead, and the allocation strategy

10   selected by the customer; and

11   (b6)   recording the available bandwidth remaining after the allocation in a plurality

12   of database tables.

1   11.   The method of claim 10, wherein the allocation strategy comprises at least one

2   of:

3   a Minimum Possible Bandwidth allocation strategy; and

4   a Maximum Possible Bandwidth allocation strategy.

1   12.   The method of claim 10, wherein the computing step (b4) comprises the steps

2   of:

3   (b4i)   computing a total transmission overhead for the at least one file transmission

4   task; and

5   (b4ii) converting the task size and the total transmission overhead into an area.

1   13.   The method of claim 10, wherein the allocating step (b5) comprises the steps

2   of:

3   (b54i) determining if the at least one file transmission task can be completed before a

4   deadline;

5   (b5ii) returning an error if the at least one file transmission task can not be completed

6   before the deadline;

7   (b5iii) allocating a lowest possible bandwidth strip to meet the deadline to the at least

8   one file transmission task if the bandwidth allocation strategy is Minimum Possible

9   Bandwidth;

10   (b5iv) allocating a highest possible bandwidth strip to meet the deadline if the

11   bandwidth allocation strategy is Maximum Possible Bandwidth;

12   (b5v)   determining if the allocating step (b5iv) completed successfully;

13   (b5vi) returning an error if the allocating step (b5iv) did not complete successfully;

14   and

15   · (b5vii) setting the allocated bandwidth and duration of allocation in the task data if the

16   allocating step (b5iv) completed successfully.

1   The method of claim 1 further comprising:

2   (c)   freeing any allocated available bandwidth unused by a transmission of the at

3   least one file transmission task.

1   15.   The method of claim 14, wherein the freeing step (c) comprises the steps of:

2   (c1)   updating a GSF;

3   (c2)   constructing a payback strip from the portion of the available bandwidth

4   allocated to the at least one file transmission task;

5   (c3)   adding the payback strip to the GSF; and

6   (c4)   recording an available bandwidth remaining after the adding step (d3) in a

7   plurality of database tables.

1   16.   The method of claim 15, wherein the constructing step (c2) comprises the steps

2   of:

3   (c2i)   finding an expiration time corresponding to the at least one file transmission

4   task in the plurality of database tables; and

5   (c2ii)   constructing the payback strip that extends in an X/time-direction until the

6   expiration time and in a Y/bandwidth direction from zero to the portion of the available

7   bandwidth allocated to the at least one file transmission task.

1   17.   The method of claim 1, wherein the at least one file transmission tasks are

2   scheduled back-to-back when duration of allocations are known when the allocations are made.

1   18.   The method of claim 1, wherein the allocation of the available bandwidth to the

2   at least one file transmission task is varied as a polynomial in time.

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A computer readable medium with program instructions for media delivery in a network, the instructions for:

(a) determining an available bandwidth for file transmission for a time interval; and

(b) allocating at least a portion of the available bandwidth to at least one file transmission task, wherein each of the at least one file transmission task may be allocated a different amount of the available bandwidth.

20. The medium of claim 19, which includes instructions for initializing a bandwidth allocation scheduler prior to the determining instruction (a), comprising the instructions for:

(a1) obtaining a plurality of system configuration parameters from a plurality of database tables;

(a2) initializing a global step function (GSF); and

(a3) subtracting from the GSF bandwidth requirements for a plurality of on-going life-video stream (LVS) jobs and LVS jobs planned from a time of initialization to a maximum transmission duration.

21. The medium of claim 20, wherein the subtracting instruction (a3) comprises the instructions for:

(a3i) recording in the plurality of database tables the LVS jobs and their bandwidth requirements;

(a3ii) subtracting from the GSF the bandwidth requirements for the LVS jobs; and

6   (a3iii)   logging a total remaining available bandwidth that can be scheduled for file

7   transmissions in the plurality of database tables.

1   22.   The medium of claim 19, wherein the determining instruction (a) comprises the

2   instructions for:

3   (a1)   updating a total available bandwidth for the time interval; and

         (a2)   checking for the available bandwidth for file transmission for the time interval.

1   23.   The medium of claim 22, wherein the updating instruction (a1) comprises the

2   instructions for:

3   (a1i)   reading from a plurality of database tables a plurality of LVS jobs to begin

4   during the time interval;

5   (a1ii)   allocating bandwidth to the plurality of LVS jobs not yet allocated bandwidth;

6   and

7   (a1iii)   recording the allocated bandwidth to the plurality of LVS jobs in the plurality

8   of database tables.

1   24.   The medium of claim 23, wherein prior to the reading instruction (a1i)

2   comprises the instructions for:

3   (a1iA)   determining if the updating of the total available bandwidth occurs often

4   enough to avoid conflicts with plurality of LVS jobs; and

5   (a1iB)   reporting an error if the updating does not occur often enough.

25. The medium of claim 23, wherein the allocating instruction (a1ii) comprises the instructions for:

(a1iiA) subtracting from a GSF the bandwidth requirements for the plurality of LVS jobs.

26. The medium of claim 23, wherein the checking instruction (a2) comprises the instructions for:

(a2i) updating a GSF;

(a2ii) determining if enough bandwidth is available for file transmissions;

(a2iii) sending an indication if there is not enough bandwidth available for file transmission; and

(a2iv) finding a bandwidth strip which begins at a current time, fits under the GSF, has at least a minimum amount of bandwidth that must be allocated to a file transmission task, and does not extend, in the X/time-direction, beyond a LDT of the at least one transmission task.

27. The medium of claim 26, wherein the finding instruction (a2iv) comprises the instructions for:

(a2ivA) finding the bandwidth strip that extends in an X/time-direction from a current time to no more than a maximum transmission duration, and in a Y/bandwidth-direction from zero to no more than a value of the GSF at any X/time value spanned by the bandwidth strip;

(a2ivB) determining if an area of the bandwidth strip is no smaller than a predetermined

8   area;

9   (a2ivC)indicating not enough bandwidth for file transmission if the area of the largest

10   found bandwidth strip is smaller than the predetermined area, or is not within a plurality of pre-

11   determined boundary conditions; and

12   (a2ivD)returning a size limitation for the at least one file transmission task if the area of

13   the bandwidth strip is smaller than the predetermined area.

1   28.   The method of claim 19, wherein the allocating instruction (b) comprises the

2   instructions for:

3   (b1)   setting an upper bound on an amount of bandwidth to a smaller of the available

4   bandwidth and a maximum bit rate of a plurality of receivers;

5   (b2)   gathering data for the at least one file transmission task, the gathered data

6   including a size of the at least one file transmission task;

7   (b3)   determining an allocation strategy selected by the customer;

8   (b4)   computing an overhead for the at least one file transmission task;

9   (b5)   allocating the portion of the available bandwidth based on the upper bound, the

10   size of the at least one transmission task, the computed overhead, and the allocation strategy

11   selected by the customer; and

12   (b6)   recording the available bandwidth remaining after the allocation in a plurality

13   of database tables.

1   29.   The medium of claim 28, wherein the allocation strategy comprises at least one

2   of:

3   a Minimum Possible Bandwidth allocation strategy; and

4   a Maximum Possible Bandwidth allocation strategy.

1   30.   The medium of claim 28, wherein the computing instruction (b4) comprises the

2   steps of:

          (b4i)   computing a total transmission overhead for the at least one file transmission

     task; and

          (b4ii)   converting the task size and the total transmission overhead into an area.

1   31.   The medium of claim 28, wherein the allocating instruction (b5) comprises the

2   instructions for:

3   (b54i)   determining if the at least one file transmission task can be completed before a

4   · deadline;

5   (b5ii)   returning an error if the at least one file transmission task can not be completed

6   before the deadline;

7   (b5iii)   allocating a lowest possible bandwidth strip to meet the deadline to the at least

8   one file transmission task if the bandwidth allocation strategy is Minimum Possible

9   Bandwidth;

10   (b5iv)   allocating a highest possible bandwidth strip to meet the deadline if the

11   bandwidth allocation strategy is Maximum Possible Bandwidth;

12   (b5v)   determining if the allocating step (b5iv) completed successfully;

13   (b5vi)   returning an error if the allocating step (b5iv) did not complete successfully;

14   and

15   (b5vii) setting the allocated bandwidth and duration of allocation in the task data if the

16   allocating step (b5iv) completed successfully.

1   32. The medium of claim 19, further comprising instructions for:

2   (c)   freeing any allocated available bandwidth unused by a transmission of the at

3   least one file transmission task.

1   33.   The medium of claim 32, wherein the freeing instruction (c) comprises the

2   instructions for:

3   (c1)   updating a GSF;

4   (c2)   constructing a payback strip from the portion of the available bandwidth

5   allocated to the at least one file transmission task;

6   (c3)   adding the payback strip to the GSF; and

7   (c4)   recording an available bandwidth remaining after the adding step (d3) in a

8   plurality of database tables.

1   34.   The medium of claim 33, wherein the constructing instruction (c2) comprises

2   the instructions for:

3   (c2i)   finding an expiration time corresponding to the at least one file transmission

4   task in the plurality of database tables; and

5   (c2ii)   constructing the payback strip that extends in an X/time-direction until the

6   expiration time and in a Y/bandwidth direction from zero to the portion of the available

7   bandwidth allocated to the at least one file transmission task.

35.   The medium of claim 19, wherein the at least one file transmission tasks are

scheduled back-to-back when duration of allocations are known when the allocations are made.

36.   The medium of claim 19, wherein the allocation of the available bandwidth to

the at least one file transmission task is varied as a polynomial in time.

A method for media delivery in a network, comprising the steps of:

        (a)   initializing a GSF;

        (b)   updating the GSF based upon bandwidth requirements for a plurality of LVS

jobs for a time interval;

        (c)   determining a size of at least one file transmission task which can be

transmitted during the time interval based upon the updated GSF; and

        (d)   allocating at least a portion of the updated GSF to at least one file transmission

task based upon the size and an allocation strategy, wherein each of the at least one

transmission task may be allocated a different amount of bandwidth.

38.   A computer readable medium with program instructions for media delivery in a

network, the instructions for:

        (a)   initializing a GSF;

        (b)   updating the GSF based upon bandwidth requirements for a plurality of LVS

jobs for a time interval;

        (c)   determining a size of at least one file transmission task which can be

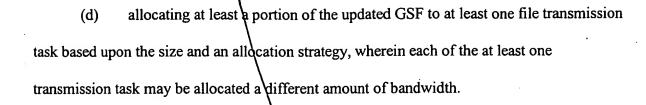transmitted during the time interval based upon the updated GSF; and

8   (d)   allocating at least a portion of the updated GSF to at least one file transmission

9   task based upon the size and an allocation strategy, wherein each of the at least one

10   transmission task may be allocated a different amount of bandwidth.

1   39.   A method for media delivery in a network, comprising the steps of:

2   (a)   determining an available bandwidth for file transmission for each of a

3   plurality of time intervals; and

4   (b)   allocating at least a portion of the available bandwidth to at least one file

5   transmission task for each time interval, wherein each of the at least one file transmission

6   task may be allocated a different amount of the available bandwidth , wherein the at least

7   one file transmission tasks for each time interval are scheduled back-to-back.

1   40.   A computer readable medium with program instructions for media delivery in a

2   network, the instructions for:

3   (a)   determining an available bandwidth for file transmission for each of a

4   plurality of time intervals; and

5   (b)   allocating at least a portion of the available bandwidth to at least one file

6   transmission task for each time interval, wherein each of the at least one file transmission

7   task may be allocated a different amount of the available bandwidth, wherein the at least one

8   file transmission tasks for each time interval are scheduled back-to-back.

1   41.   A method for media delivery in a network, comprising the steps of:

2   (a)   determining an available bandwidth for file transmission for a time interval;

3   and

4   (b)   allocating at least a portion of the available bandwidth to at least one file

5   transmission task, wherein each of the at least one file transmission task may be allocated a

6   different amount of the available bandwidth, wherein the allocated available bandwidth

7   varies as a polynomial in time.

1   42.   A computer readable medium with program instructions for media delivery in a

2   network, the instructions for:

3   (a)   determining an available bandwidth for file transmission for a time interval;

4   and

5   (b)   allocating at least a portion of the available bandwidth to at least one file

6   transmission task, wherein each of the at least one file transmission task may be allocated a

7   different amount of the available bandwidth, wherein the allocated available bandwidth

8   varies as a polynomial in time.

1   43.   A system, comprising:

2   a server, comprising a manager for file transmissions via a satellite transponder,

3   wherein the manager comprises a bandwidth allocation scheduler, the bandwidth allocation

4   scheduler capable of allocating a different amount of an available bandwidth to each of a

5   plurality of file transmission tasks; and

6   a database table coupled to the server, comprising information required by the manager

7   for file transmissions.